

I CLAIM:

1. A metal material as laser marked by a thermally  
activated, chemically based marking method comprising the  
5 steps of:

applying a layer of mixed metal oxide material  
containing an energy absorbing enhancer to a  
metal substrate; and

10 irradiating said layer with a radiant energy beam  
having a wavelength selected to excite the  
energy absorbing enhancer in accordance with the  
form of a marking to be applied, thereby forming  
a marking layer atop the substrate.

15 2. A substrate material as laser marked by a  
thermally activated chemically based marking method  
comprising the steps of:

applying a layer of mixed metal oxide material  
containing an energy absorbing enhancer to a  
20 substrate selected from the group consisting of  
aluminum, brass, chrome, copper, nickel, steel,  
stainless steel, tin, glass, ceramic, porcelain,  
and plastic; and

25 irradiating said layer with a radiant energy beam  
having a wavelength selected to excite the  
energy absorbing enhancer in accordance with the  
form of a marking to be applied, thereby forming  
a marking layer atop the substrate.

30

3. A substrate material as laser marked by a thermally activated chemically based marking method comprising the steps of:

5       applying a layer of mixed metal oxide material containing an energy absorbing enhancer to a substrate to be marked in the form of a marking to be applied; and  
10       irradiating said layer with a radiant energy beam having a wavelength selected to excite the energy absorbing enhancer, thereby forming a marking layer atop the substrate.

4. A thermally activated, chemically based marking method comprising the steps of:

15       applying a layer of mixed organic pigment material containing an energy absorbing enhancer to a plastic substrate; and  
20       irradiating said layer with a radiant energy beam having a wavelength selected to excite the energy absorbing enhancer in accordance with the form of a marking to be applied, thereby forming a marking layer atop the substrate.

25       5. The method of claim 4 further comprising the step of providing a laminar air flow across the substrate during the irradiating step.

30       6. The method of claim 4, wherein the energy absorbing enhancer further comprises carbon black.

7. The method of claim 4, wherein the radiant energy beam further comprises a laser beam having an energy level ranging between 1 and 30 watts, a spot size ranging between 5 and 200 microns, and a marking speed along the substrate ranging between 25 and 1000mm/sec.

8. The method of claim 4, wherein the layer of mixed organic pigment material further comprises a thickness ranging between 5 and 500 microns.

9. The method of claim 4 further comprising the step of starting at a room temperature of about 70° F.

10. A plastic material as laser marked by the process according to claim 4.

11. A thermally activated chemically based marking method comprising the steps of:

- applying a mixed organic pigment material containing an energy absorbing enhancer to a carrier;
- placing the carrier in contact with the substrate to be marked; and
- irradiating the carrier with a radiant energy beam having a wavelength selected to excite the energy absorbing enhancer in accordance with the form of a marking to be applied, thereby forming a marking layer atop the substrate.

30

12. A thermally activated chemically based marking method comprising the steps of:

5       applying a layer of mixed organic pigment material  
          containing an energy absorbing enhancer to a  
          substrate to be marked in the form of a marking  
          to be applied; and  
          irradiating said layer with a radiant energy beam  
10       having a wavelength selected to excite the  
          energy absorbing enhancer, thereby forming a  
          marking layer atop the substrate.

13. The method of claim 12 further comprising the step  
15 of providing a laminar air flow across the substrate during  
the irradiating step.

14. The method of claim 12, wherein the energy  
absorbing enhancer further comprises carbon black.

20       15. The method of claim 12, wherein the radiant energy  
beam further comprises a laser beam having an energy level  
ranging between 1 and 30 watts and a marking speed along the  
substrate ranging between 25 and 1000mm/sec.

25       16. The method of claim 12, wherein the layer of mixed  
organic pigment material further comprises a thickness  
ranging between 5 and 500 microns.

17. The method of claim 12 further comprising the step  
30 of starting at a room temperature of about 70° F.

18. A glass material as laser marked by the process according to claim 12.

19. A thermally activated, chemically based marking  
5 method comprising steps of:

applying a layer having an organic pigment  
component and comprising an energy absorbing  
enhancing component to a plastic substrate; and  
10 irradiating said layer with a radiant energy beam  
having a wavelength selected to excite the  
energy absorbing enhancing component, thereby  
forming an adhered layer atop the substrate.

20. A thermally activated chemically based marking  
15 method comprising steps of:

applying a material comprising an energy absorbing  
organic pigment to a carrier;  
placing the carrier in contact with the substrate  
to be marked; and  
20 irradiating the carrier with a radiant energy beam  
having a wavelength selected to excite the  
energy absorbing enhancing component in  
accordance with the form of a marking to be  
applied, thereby forming a marking layer atop  
25 the substrate.

21. A thermally activated chemically-based marking  
method comprising steps of:

applying a material comprising an organic pigment  
30 and an energy absorbing enhancing component to a  
carrier;

placing the carrier in contact with the substrate  
to be marked; and  
irradiating the carrier with a radiant energy beam  
having a wavelength selected to excite the  
energy absorbing enhancing component in  
accordance with the form of a marking to be  
applied, thereby forming a marking layer atop  
the substrate.

22. A thermally activated chemically based marking  
method comprising steps of:

applying a material including an organic pigment  
which comprises an energy absorbing enhancing  
component to a substrate to be marked in the  
form of a marking to be applied; and

irradiating said layer with a radiant energy beam  
having a wavelength selected to excite the  
energy absorbing enhancing component, thereby  
forming a marking layer atop the substrate.

23. A thermally activated, chemically based marking  
method comprising steps of:

applying a layer of a marking material comprising  
at least one organic pigment to a markable  
substrate comprising at least one plastic; and  
irradiating said layer with a radiant energy beam  
having a wavelength selected to be absorbed by  
said marking material, thereby forming a bonded  
layer atop said substrate.

24. The method of claim 23, wherein said organic pigment absorbs radiant energy.

25. The method of claim 23, wherein said marking  
5 material further comprises an energy absorbing enhancing component.

TOGETHER 660E660